

Name:

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Solution

1. A parabola has equation  $f(x) = x^2 - 9$ . Determine how many x-intercepts the parabola has.

$$0 = (x-3)(x+3)$$
$$x=3 \quad x=-3$$

The parabola has  
Two x-intercepts.  
(3,0) & (-3,0)

2. A parabola has equation  $f(x) = (x+3)^2 + 1$ . Determine how many x-intercepts the parabola has.

V(-3,1) opens upward

The parabola has  
no x-intercepts.

3. A parabola has equation  $f(x) = x(x-6)$ . Determine how many x-intercepts the parabola has.

$$0 = (x)(x-6)$$
$$x=0 \quad x=6$$

The parabola has two  
x-intercepts (0,0) & (6,0)

4. A parabola has equation  $f(x) = -x^2 + 8x$ . Determine how many x-intercepts the parabola has.

$$0 = -x(x-8)$$
$$x=0 \quad x=8$$

The parabola has two  
x-intercepts  
(0,0) & (8,0)

5. A parabola has equation  $f(x) = (x+2)(x-10)$ . Determine how many x-intercepts the parabola has.

$$0 = (x+2)(x-10)$$
$$x=-2 \quad x=10$$

The parabola has two  
x-intercepts  
(-2,0) & (10,0)

6. A parabola has equation  $f(x) = -(x+4)^2$ . Determine how many x-intercepts the parabola has.

$$0 = -(x+4)^2$$
$$0 = (x+4)^2$$
$$0 = x+4$$
$$-4 = x$$

The parabola has  
one x-intercept  
(-4,0)

7. Given the parent function  $f(x) = x^2$ , pick the description that best fits the transformation  $T(x) = (x-1)^2 - 4$ . Determine how many x-intercepts the parabola has.

- a. The graph of  $f(x) = x^2$  is shifted left 1 unit and down 4 units
- b. The graph of  $f(x) = x^2$  is shifted right 1 unit and up 4 units
- c. The graph of  $f(x) = x^2$  is shifted left 1 unit and up 4 units
- ☒ d. The graph of  $f(x) = x^2$  is shifted right 1 unit and down 4 units

8. Given the parent function  $f(x) = x^2$ , pick the description that best fits the transformation  $T(x) = (x+1)^2 + 4$ . Determine how many x-intercepts the parabola has.

- a. The graph of  $f(x) = x^2$  is shifted left 1 unit and shifted down 4 units
- b. The graph of  $f(x) = x^2$  is shifted right 1 unit and shifted up 4 units
- ☒ c. The graph of  $f(x) = x^2$  is shifted left 1 unit and shifted up 4 units
- d. The graph of  $f(x) = x^2$  is shifted right 1 unit and shifted down 4 units

9. Given the parent function  $f(x) = x^2$ , pick the function that best fits the transformation of  $f(x)$  shifted 3 units to the left and shifted 5 units up.

- a.  $T(x) = (x-3)^2 + 5$
- ☒ b.  $T(x) = (x+3)^2 + 5$
- c.  $T(x) = (x-3)^2 - 5$
- d.  $T(x) = (x+3)^2 - 5$

10. Solve the equation  $16 = (x+3)^2$

$$\begin{aligned}\pm\sqrt{16} &= \sqrt{(x+3)^2} \\ \pm 4 &= x+3 \\ -3 \pm 4 &= x\end{aligned}$$

$x = -3 - 4 = -7$   
or  
 $x = -3 + 4 = 1$

11. Solve the equation  $0 = (x-1)^2 - 25$

$$\begin{aligned}25 &= (x-1)^2 \\ \pm\sqrt{25} &= \sqrt{(x-1)^2} \\ \pm 5 &= x-1 \\ 1 \pm 5 &= x\end{aligned}$$

$x = 1 - 5 = -4$   
or  
 $x = 1 + 5 = 6$

12. Solve the equation  $0 = 2(x+2)^2 - 18$

$$\begin{aligned}18 &= 2(x+2)^2 \\ 9 &= (x+2)^2 \\ \pm\sqrt{9} &= \sqrt{(x+2)^2} \\ \pm 3 &= x+2 \\ -2 \pm 3 &= x\end{aligned}$$

$x = -2 - 3 = -5$   
or  
 $x = -2 + 3 = 1$

13. Solve the equation  $0 = (x-6)^2 + 1$

$$\begin{aligned}-1 &= (x-6)^2 \\ (x-6)^2 &\text{ cannot be negative}\end{aligned}$$

There are no real solutions

14. Find the coordinates of the x-intercepts of the parabola with equation  $f(x) = (x+5)^2 - 1$

x-intercepts have the form  $(x, 0)$   
therefore  $y = 0$  or  $f(x) = 0$

$$\begin{aligned}0 &= (x+5)^2 - 1 \\ 1 &= (x+5)^2 \\ \pm\sqrt{1} &= \sqrt{(x+5)^2} \\ \pm 1 &= x+5 \\ -5 \pm 1 &= x\end{aligned}$$

$x = -5 - 1 = -6$   
or  
 $x = -5 + 1 = -4$   
The x-intercepts are  $(-6, 0)$  &  $(-4, 0)$

15. Find the coordinates of the x-intercepts of the parabola with equation  $f(x) = (x+5)^2 - 36$

$$\begin{aligned}
 f(x) &= 0 \\
 0 &= (x+5)^2 - 36 \\
 36 &= (x+5)^2 \\
 \pm \sqrt{36} &= \sqrt{(x+5)^2} \\
 \pm 6 &= x+5
 \end{aligned}$$

$-5 \pm 6 = x$   
 $x = -5 - 6 = -11$   
 or  
 $x = -5 + 6 = 1$   
 The x-intercepts are  $(-11, 0)$  &  $(1, 0)$

16. Find the coordinates of the x-intercepts of the parabola with equation  $f(x) = -(x+7)^2 + 4$

$$\begin{aligned}
 f(x) &= 0 \\
 0 &= -(x+7)^2 + 4 \\
 -4 &= -(x+7)^2 \\
 4 &= (x+7)^2
 \end{aligned}$$

$\pm \sqrt{4} = \sqrt{(x+7)^2}$   
 $\pm 2 = x+7$   
 $-7 \pm 2 = x$   
 or  $x = -7 - 2 = -9$   
 or  $x = -7 + 2 = -5$   
 The x-intercepts are  $(-9, 0)$  &  $(-5, 0)$

17. Find the coordinates of the x-intercepts of the parabola with equation  $f(x) = (x-1)^2 + 4$

$$\begin{aligned}
 f(x) &= 0 \\
 0 &= (x-1)^2 + 4 \\
 -4 &= (x-1)^2
 \end{aligned}$$

$(x-1)^2$  cannot equal a negative number

There are no x-intercepts

18. Graph the quadratic equation  $f(x) = x^2 - 6x + 8$

$a = 1$   
concave up

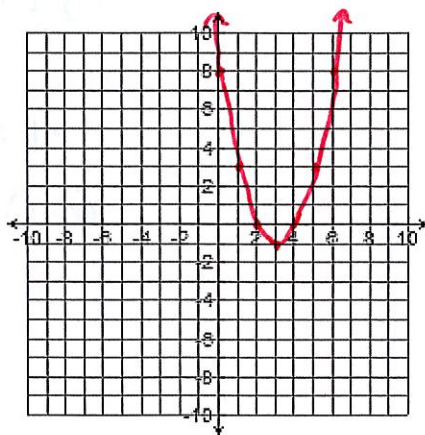
axis of symmetry  $x = -\frac{b}{2a}$

$$x = \frac{-(-6)}{2(1)} = \frac{6}{2} = 3$$

$$\begin{aligned}
 f(3) &= (3)^2 - 6(3) + 8 \\
 &= 9 - 18 + 8 \\
 &= -1
 \end{aligned}$$

Vertex  $V(3, -1)$

Increasing pattern is 1, 3, 5, ... since  $a = 1$

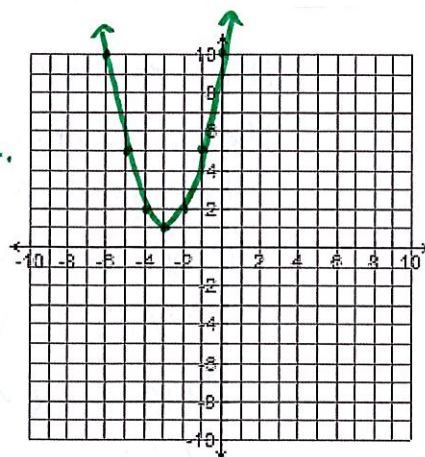


Graph the quadratic equation  $f(x) = (x+3)^2 + 1$

vertex is  $V(-3, 1)$

$a=1$  Increasing pattern is 1, 3, 5, ...

$a=1$  concave up

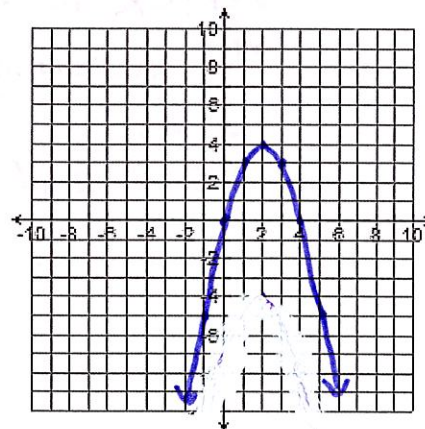


19. Graph the quadratic equation  $f(x) = -(x-2)^2 + 4$

$a=-1$  concave down

the pattern is 1, 3, 5, ...

Vertex is  $V(2, 4)$



20. Graph the quadratic equation  $f(x) = (x-5)(x-1)$

$a=1$   
concave up

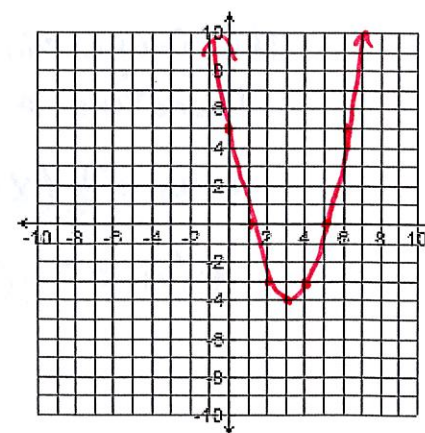
The x-intercepts are  $x=5$  &  $x=1$

The axis of symmetry is  $x=3$

$f(3) = (3-5)(3-1) = (-2)(2) = -4$

The vertex is  $V(3, -4)$

The increasing pattern is 1, 3, 5, ...



21. For the parabola shown, determine an equation in vertex form.

The vertex is  $V(1,1)$

The increasing pattern is 1, 3, 5, ...

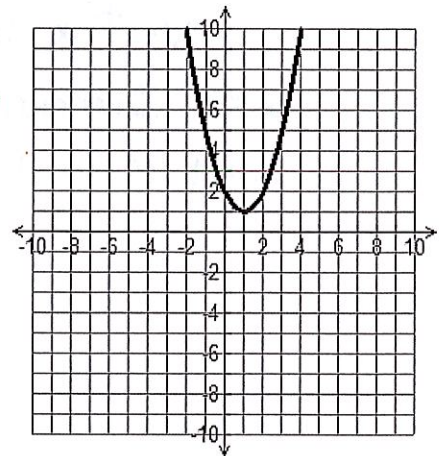
Therefore  $a = 1$

$$f(x) = a(x-h)^2 + k$$

$$V(1,1) = V(h,k)$$

$$f(x) = 1(x-1)^2 + 1$$

$$f(x) = (x-1)^2 + 1$$



22. For the parabola shown, determine an equation in vertex form.

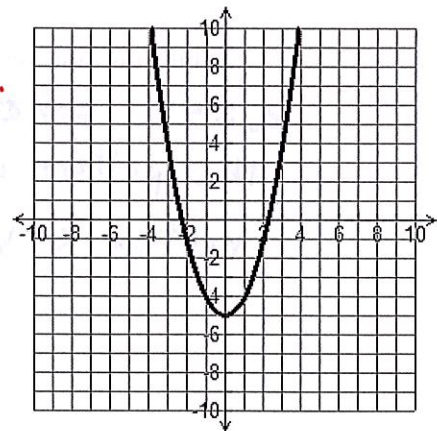
vertex is  $V(0, -5)$

The increasing pattern is 1, 3, 5, ...

$a = 1$

$$f(x) = 1(x-0)^2 - 5$$

$$f(x) = x^2 - 5$$



23. For the parabola shown, determine an equation in vertex form.

Vertex is  $V(-2, 0)$

The increasing pattern is  $\frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \dots$

Therefore  $a = -\frac{1}{2}$

$$f(x) = -\frac{1}{2}(x-(-2))^2 + 0$$

$$f(x) = -\frac{1}{2}(x+2)^2$$

